The Role of Transitional Levels to Explain the ^{237}Np (γ,f) Cross Section Structures Near the Threshold

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The transition levels at the top of the two ^{237}Np fission barriers were, for the first time, obtained by means of the so-called semi-microscopic combined method using Lipkin-Nogami projectors in the BCS approach which we have recently developed and implemented[1]. In order to overcome the difficulties in dealing with large nuclear deformations, we used the BARRIER code[2], which calculates single particle spectra in a deformed Woods-Saxon potential. The results enabled us to describe the experimentally observed near-barrier photofission cross section structures for ^{237}Np[3]. In particular, the long standing issue on the physical nature of a ^{237}Np(γ,f) structure around $5.7 - 5.8$ MeV, systematically measured in the last three decades, was nicely elucidated in terms of a bunch of transition states at the top of the highest and inner barrier (height $\cong 5.7$ MeV). Also, an experimentally observed sub-barrier shelf was identified as belonging to a bunch of levels at the top of the lowest and outer barrier (height $\cong 5.2$ MeV).

References

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